

Research Article

Extent of use of soil and water resources by the farm families of Bijapur and Chitradurga districts of Karnataka

■ ANIL BIRADAR, S.S. DOLLI, SHREESHAIL RUDRAPUR AND MITHUN P. KUDACHI

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SUMMARY : The study conducted revealed that, the average land holding of small, medium and large farmers of Bijapur district was 3.36 acre, 7.88 acre and 14.76 acre, respectively and in case of Chitradurga district average land holding of small, medium and large farmers was 2.56 acre, 7.86 acre and 13.68 acre, respectively. With respect to soil type and extent, most of the small farmers (97.61%) possessed black soil, followed by large farmers (79.5%) and medium farmers (76.39%) in Bijapur district. With respect to soil type and extent in Chitradurga district, all most all farmers were having red soil. With respect to vegetation resource is considered in Bijapur district, small famers possessed higher number of fruit and forest trees per acre (0.80 and 2.66), where medium and large farmers had almost same number of fruit trees (0.25 and 0.22/ac), however, with respect to forest trees, large farmers had relatively more forest trees (1.42/ac) than medium farmers (0.97/ac) and the same was observed in Chitradurga district also. The livestock component is concerned, small farmers had higher number of livestock per acre (0.57) followed by medium (0.39) and large farmers (0.31). In case of Chitradurga district, small farmers had higher number of livestock (0.72/ac) followed by medium (0.20) and large farmers (0.15). The source of water for irrigation was open well as well as borewell in Bijapur district. While, in case of Chitradurga district, only borewell was the source of water for irrigation. The number of open wells and borewells in Bijapur district were found higher among large farmers *i.e.* 50 per cent of large farmers had open wells and 62.50 per cent had borewells, followed by medium farmers (58 % of wells and 38.50 % of borewell) and small farmers (33.33 % of wells and 8.33 % of borewell), whereas, the number of borewells in Chitradurga district was found higher among large farmers (91.67 %), followed by medium farmers (78%) and small farmers (8.33%).

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Author for correspondence :

SHREESHAIL

RUDRAPUR

Department of Agricultural Economics, College of Agriculture, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA
Email: shree4476@gmail.com

See end of the article for authors' affiliations

BACKGROUND AND OBJECTIVES

Natural resources are the basis for life on earth. However, rapidly growing consumption is pushing the earth's carrying capacity to the limit. Resources are the backbone of every economy. In using resources and transforming them, capital stocks are built up which add to the wealth of present and future generations. However, the dimensions of our current resource use are such

that the chances of future generations - to have access to their fair share of scarce resources are endangered. Moreover, the consequences of our resource use in terms of impacts on the environment may induce serious damages that go beyond the carrying capacity of the environment. In dry land agriculture, soil and rain water are the two naturally available resources with farmers. Under given situation, it is the rainfall variation that causes fluctuations in productivity from year-

year. So, there is a need of efficient use of available stored moisture.

The average size of operational holdings in India has diminished progressively from 2.28 ha in 1970-71 to 1.55 ha in 1990-91 to 1.23 ha in 2005-06. As per Agriculture Census 2005-06, the proportion of marginal holdings (area less than 1 ha) has increased from 61.6 per cent in 1995-96 to 64.8 per cent in 2005-06. This is followed by about 18 per cent small holdings (1-2 ha.), about 16 per cent medium holdings (more than 2 to less than 10 ha.) and less than 1 per cent large holdings (10 ha. and above) (Anonymous, 2010).

It is evident from the facts that, resources use pattern differs from farmers to farmers which contributes ultimately to productivity and farm income. In this context of shrinking resource base, the agriculture research and extension service should focus on efficient use of resources, the present study has been taken up to assess extent of use of soil and water resources by the farm families of Bijapur and Chitradurga districts of Karnataka.

RESOURCES AND METHODS

The present study was carried out at Bijapur and Chitradurga districts of Karnataka during the year 2012-2013.

Research design :

In the present study, ex-post facto research design was employed. This design was appropriate because the phenomenon had already occurred. Ex-post-facto research is the most systematic empirical enquiry in which the researcher does not have any control over independent variables as their manifestation has already occurred or as they are inherent and not manipulatable thus, inferences about relations among variables were made without direct intervention from concomitant variation of independent and dependent variables.

Selection of the study area :

The present study was conducted in Bijapur and Chitradurga districts of Karnataka during the year 2012-13. Bijapur and Chitradurga districts were purposively selected for the study as these districts have large area under rainfed condition.

Selection of taluks, villages and respondents :

In Bijapur and Chitradurga district, one taluk each was

selected namely Bijapur and Chitradurga based on the criteria of high area under rainfed condition. Further two villages namely Kumathe and Nagal in Bijapur taluk and two villages namely Konanur and Bommanagatihalli in Chitradurga taluk were as representative villages. The list of farm families in the selected villages was obtained from village accountant. Twelve respondents each from small, medium and large farmers category were selected by simple random procedure, thus forming a sample of 144 farmers.

Sources and method of data collection :

The data were collected from the sample farmers by personal interview method with the help of structured pre-tested schedule. The data were collected on socio-economic characters of farmers such as family size and composition, land holdings and education level. Further, the data on existing livelihood systems, cultivation aspects and income generation from farm were collected from the selected farmers. The opinions of respondents were obtained with respect to constraints in securing livelihood systems. Schedule was developed considering the objectives and variables of the study, same was pre-tested in non-sample area.

Statistical tools used in the study :

Frequency and percentages :

Frequency and percentages were calculated for making simple comparison wherever needed. Mean and standard deviation, these were used to classify the respondents into three categories as follows.

Category	Score
Low	$< (\bar{X} - 0.425 \text{ S.D.})$
Medium	$(\bar{X} \pm 0.425 \text{ S.D.})$
High	$> (\bar{X} + 0.425 \text{ S.D.})$

OBSERVATIONS AND ANALYSIS

The finding of the study as well as relevant discussion have been summarized under following heads.

Soil resource of the farmers :

The results in the Table 1 indicate that, major proportion of farmers in Bijapur district (75.00 %) were having only black soil, 15.28 per cent of the farmers were having only red soil,

Table 1 : Soil resources of the farmers

Soil type	Bijapur (n ₁ =72)		Chitradurga (n ₂ =72)		Total (n=144)	
	F	%	F	%	F	%
Only black soil	54	75.00	0	0.00	54	37.50
Only red soil	11	15.28	71	98.61	82	56.94
Black and red soil	5	6.94	1	1.39	6	4.17
Others	2	2.78	0	0.00	2	1.39

6.94 per cent and 2.78 per cent of the farmers were having black and red soil and other soils, respectively. Whereas, Chitradurga district is considered, majority of the farmers (98.61 %) were having only red soil followed by 1.39 per cent of both black and red soil and none of the farmers were having only black or other soil types. This is so because, the Bijapur district comes under Deccan plateau, which is rich in black soil and whereas Chitradurga region is rich in red soil.

Water resource of the farmers :

It was noticed from the Table 2 that, higher proportion of the farmers (44.44 %) in Bijapur district were not at all having any source of water for irrigation, they were completely dependent on rain for their crops. Whereas, 25 per cent of the farmers were having both wells and borewells followed by 19.44 per cent and 11.11 per cent of the farmers were having only wells and only borewells. In case of Chitradurga district, majority of the farmers (55.56 %) were having borewells and the remaining 44.44 per cent of the farmers were not at all having any kind of source of water as they were completely dependent on rain water. This shows that major proportion of the farmers in Bijapur district were having wells and borewells, but only borewells were observed in Chitradurga district, this may be because traditionally open wells are used as source of irrigation as well as drinking water in Bijapur district. It has been continued to same extent even today. The findings were partially in tune with the findings of Rathod (2007).

Extent of use of soil and water resource by farmers :

Extent of use of soil resource by farmers :

The data on average land holding, soil type and extent, cropping intensity, vegetation resource and livestock

components were analyzed and same are presented in the Table 3. With respect to soil type and extent, most of the small farmers (97.61%) possessed black soil, followed by large farmers (79.5%) and medium farmers (76.39%) in Bijapur district. The Bijapur district comes under deccan plateau which was dominated by black soil, hence, major portion of soil was black soil in this district. With respect to soil type and extent in Chitradurga district, all most all farmers were having red soil, while the medium and large farmers were having 100 per cent of red soil followed by small farmers (96.87%), it was due to the fact that soil type in the Chitradurga region is red soil, so almost all the farmers were having red soil.

Further, it was observed that, the cropping intensity in the black soil was higher in medium farmers (200%) followed by small farmers (182.5%) and large farmers (180%). While in case of Chitradurga district, highest cropping intensity of 188 per cent was observed with medium farmers (188%) followed by large farmers (185%) and small farmers (129%). As it was seen from the data that large farmers land area was three times larger than small farmers and two times larger than medium farmers. Hence, small and medium farmers had involved intensively in farming to harvest more crop yield to secure their livelihood. While large farmers did not involve seriously in intensive farming. The large farmers might have found difficult to take up the *Rabi* crop due to non-availability of labours and other inputs. As revealed by the investigation, small and medium farmers had better utilized the land as compared to large farmers. Dolli (2006) in his study found that the small size village was more efficient in natural resource development and management by exhibiting higher sustainability index.

As per vegetation resource is considered, small farmers

Table 2 : Water resources of the farmers

Water resource	Bijapur (n ₁ =72)		Chitradurga (n ₂ =72)		Total (n=144)	
	F	%	F	%	F	%
	Only open well	14	19.44	0	0.00	14
Only borewell	8	11.11	40	55.56	48	33.33
Open well and borewell	18	25.00	0	0.00	18	12.50
None	32	44.44	32	44.44	64	44.44

Table 3 : Extent of use of soil resource by farmers

Category	Districts	Avg. land holding (ac)	Soil type and extent		Cropping intensity (%)		Vegetation resource		Livestock component (per acre)
			Black avg. (ac)	Red avg. (ac)	Black soil	Red soil	Fruit trees (per acre)	Forest trees (per acre)	
Small (n ₁ =48)	Bijapur	3.36	3.28 (97.61)	0.08 (2.39)	182.5	180	0.80	2.66	0.57
	Chitradurga	2.56	0.08 (3.12)	2.48 (96.87)	100	129	0.34	1.40	0.72
Medium (n ₂ =48)	Bijapur	7.88	6.02 (76.39)	1.86 (23.61)	200	158.3	0.22	0.97	0.39
	Chitradurga	7.86	0.00 (0.00)	7.86 (100)	-	188	0.39	0.82	0.20
Large (n ₃ =48)	Bijapur	14.76	11.70 (79.5)	3.06 (20.41)	180	98.5	0.25	1.42	0.31
	Chitradurga	13.68	0.00 (0.00)	13.68 (100)	-	185	0.20	0.76	0.15

possessed higher number of fruit and forest trees per acre (0.80 and 2.66), where medium and large farmers had almost same number of fruit trees (0.25 and 0.22/ac), however, with respect to forest trees, large farmers had relatively more forest trees (1.42/ac) than medium farmers (0.97/ac) and the same was observed in Chitradurga district also. Similar findings were found by Dickey and Vanderholm (1981).

The results made it clear that small and medium farmers were keen to secure their livelihood status through various means; thus, involvement was high in planting and maintaining of fruit and forest trees. Another reason might be the fruit and forest plants received under various schemes by all category farmers might be same, but number of plants in proportion to the land was higher. In case of small and medium farmers should be motivated to plant more perennial crops like forest and fruit trees, it leads to increase in economic returns as well as good environment.

The livestock component is concerned, small farmers had higher number of livestock per acre (0.57) which includes goats and buffaloes, followed by medium (0.39) and large farmers (0.31), due to small land holding by small farmers, they had adopted subsidiary occupation mainly livestock, consisting of goat (2-4 in number) and buffalo (1-2 in number). Rathod (2007) in his study stated that the composition of livestock was more for goats (10.19%) followed by sheep (4.48%), cows (1.58), buffaloes (1.42) and bullocks (1.33). Similar results were found by Bailey and Welling (1999) and Robbins (1979) and the results coincide with the results found in the present investigation.

In case of Chitradurga district, small farmers had higher number of livestock (0.72/ac), comprised of higher number of cows and bullocks, and followed by medium (0.20) and large farmers (0.15). As the land holding of farmers especially marginal and small were small, they had resorted to livestock

particularly rearing of milch animals as the subsidiary occupation. In this district common grazing of village livestock by one or two person had been followed, hence, it did not add extra burden of grazing to farmers, in turn farmers got additional income from them. Hence, majority of farmers adopted 1-2 cow or buffalo. While in case of Bijapur, all farmers faced the problem of fodder. This implies that the poor farmers would have to adjust and adapt their livelihood strategies in a way that ensures their subsistence in a risky environment. It is important to popularize integrated farming system including different components to make better use of the soil and other resources.

Extent of use of water resource by farmers :

An insight in the Table 4 depicts that, the source of water for irrigation was open well as well as borewell in Bijapur district. While, in case of Chitradurga district, only borewell was the source of water for irrigation. Though the number of open wells in Bijapur district was less. Similarly number of borewells in Chitradurga district was also less.

The number of open wells and borewells in Bijapur district were found higher among large farmers *i.e.* 50 per cent of large farmers had open wells and 62.50 per cent had borewells, followed by medium farmers (58 % of wells and 38.50 % of borewell) and small farmers (33.33 % of wells and 8.33 % of borewell). Whereas, the number of borewells in Chitradurga district was found higher among large farmers (91.67%), followed by medium farmers (78%) and small farmers (8.33%).

Traditionally, open wells were used as source of irrigation as well as drinking water in Bijapur district. It has been continued to same extent even today. Hence, more of the large and medium farmers due to their affordability to dig open well had pressed open wells. Recently, borewells had been adopted by farmers in the region especially to support high value crop

Table 4 : Extent of use of water resource by farmers

Districts	Category	Source of water	Number		Number of well / borewells	Avg. output / yr (Lakh lt.)	Water use efficiency (kg/ac/cm)
			F	%			
Bijapur	Small	Well	8	33.33	8	7.49	0.79
		Borewell	2	8.33	2		
	Medium	Well	14	58.33	14	9.19	0.72
		Borewell	9	37.50	11		
	Large	Well	12	50.00	15	39.78	0.66
		Borewell	15	62.50	24		
Chitradurga	Small	Well	0	0.00	0	11.25	1.62
		Borewell	2	8.33	2		
	Medium	Well	0	0.00	0	38.88	1.48
		Borewell	18	75.00	32		
	Large	Well	0	0.00	0	45.53	1.42
		Borewell	22	91.67	45		

like grapes and banana.

While in case of Chitradurga district, open wells were not practiced traditionally. Borewells were adopted by farmers during last one decade with the introduction of groundnut and arecanut plantation in this region as high value crop. Depending on the affordability and area, most of large farmers and medium farmers possessed borewells for irrigation. Hence, higher water availability and also higher water output (39.78 lakh lt.) was observed with large farmers followed by medium farmers (9.19 lakh lt.) and small farmers (7.49 lakh lt.) The findings were partially in tune with the findings of Rathod (2007).

Further, it could be seen from the Table that the small famers recorded higher water use efficiency (0.79 and 1.62 kg/cm/ac), while medium and large farmers had same water use efficiency (0.72 and 0.66 kg/cm/ac) in Bijapur district as well as in Chitradurga district (1.487 and 1.42 kg/cm/ac). It was because of the reasons mentioned earlier the managerial ability in small farmers was higher as compared to medium and large farmers due to small land holding. Added to this, involvement of family labour work was more in case of small and marginal farmers, which has direct effect on water use efficiency. Similar work related to use of soil and water resources was also done by Bouwer (1986); Greenwood and Mckenzie (2001) and Knezevich (1975).

Authors' affiliations :

ANIL BIRADAR, S.S. DOLLI AND MITHUM P. KUDACHI,
Department of Agricultural Extension Education, College of Agriculture,
University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

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